



1
00:00:00,000 --> 00:00:15,190
(Music)

2
00:00:15,210 --> 00:00:17,710
Steve Zornetzer: NASA Ames has just completed the first new building

3
00:00:17,730 --> 00:00:21,260
on its campus in twenty-five years.

4
00:00:21,280 --> 00:00:22,930
It's a very exciting building.

5
00:00:22,950 --> 00:00:27,800
It's extremely energy efficient, it's extremely sustainable in its design

6
00:00:27,820 --> 00:00:30,180
and its functionality.

7
00:00:30,200 --> 00:00:32,950
The building, called Sustainability Base,

8
00:00:32,970 --> 00:00:37,210
was named after and in honor of the Apollo 11 astronauts

9
00:00:37,230 --> 00:00:41,170
that landed on the lunar surface at Tranquility Base

10
00:00:41,190 --> 00:00:43,720
over forty years ago.

11
00:00:43,740 --> 00:00:47,960
Sustainability Base is designed to bring NASA technology

12
00:00:47,980 --> 00:00:51,940
and NASA ingenuity to create a living testbed

13
00:00:51,960 --> 00:00:56,390

for the evaluation of new energy efficient technologies and approaches

14

00:00:56,410 --> 00:00:59,400

that can benefit the people of planet Earth

15

00:00:59,420 --> 00:01:02,960

as we move forward into the twenty-first century.

16

00:01:02,980 --> 00:01:23,810

(Music)

17

00:01:23,830 --> 00:01:27,440

William McDonough: "Cradle to Cradle" is a design strategy

18

00:01:27,460 --> 00:01:31,420

that looks at materials as nutrition.

19

00:01:31,440 --> 00:01:36,870

And looks at energy as something that comes from renewable sources.

20

00:01:36,890 --> 00:01:40,480

And looks at water as something that is meant to be clean and drinkable.

21

00:01:40,500 --> 00:01:45,140

So this building is looking at its material as either biological nutrition,

22

00:01:45,160 --> 00:01:51,440

things that should go back to soil, air or water safely, with a productive agenda.

23

00:01:51,460 --> 00:01:56,710

Or looks at things as technical nutrients, things that could go back to technology,

24

00:01:56,730 --> 00:02:00,260

the steels, the plastics, the polymers and so on.

25

00:02:00,280 --> 00:02:06,030

This is a really critical subtext for Sustainability Base.

26

00:02:06,050 --> 00:02:14,400

This building and this complex will have that fundamental characteristic.

27

00:02:14,420 --> 00:02:18,370

Kevin Burke: Our solution for Sustainability Base, for this building and landscape

28

00:02:18,390 --> 00:02:22,440

is really a combination of high technology and ancient wisdom.

29

00:02:22,460 --> 00:02:26,270

We were able to set the building on an east-west axis to take advantage

30

00:02:26,290 --> 00:02:32,640

and capture the breezes that are coming down the bay from the north on a daily basis

31

00:02:32,660 --> 00:02:34,880

and moving across the building site.

32

00:02:34,900 --> 00:02:39,790

So we could minimize the depth of the building to about fifty-five feet

33

00:02:39,810 --> 00:02:45,600

and create a building that really operates as much as possible on natural ventilation.

34

00:02:45,620 --> 00:02:50,320

One of the early inspirations that we had were these giant wind tunnels.

35

00:02:50,340 --> 00:02:52,330

They have this exoskeleton.

36

00:02:52,350 --> 00:02:57,250

They take the structure and they move it to the outside and expose it

37

00:02:57,270 --> 00:03:00,910

so that they create a column-free space.

38

00:03:00,930 --> 00:03:03,820

There's no inhibition to the movement of air.

39

00:03:03,840 --> 00:03:08,310

This framework supports the seismic lateral loads in the building,

40

00:03:08,330 --> 00:03:13,080

but it also provides the armature for the shading elements that

41

00:03:13,100 --> 00:03:18,850

minimize the heat gain that we have in the building.

42

00:03:18,870 --> 00:03:23,180

Daniel Bufton: Sustainability Base was very cleverly designed.

43

00:03:23,200 --> 00:03:28,250

In lieu of a cooling tower, we've used a series of geothermal wells.

44

00:03:28,270 --> 00:03:33,350

That allows us to use a temperature gradient of natural water,

45

00:03:33,370 --> 00:03:38,040

pump it through the building and to either adapt for heating or cooling needs

46

00:03:38,060 --> 00:03:40,330

as required by the building.

47

00:03:40,350 --> 00:03:45,530

It's a very state of the art technology and we're actually making it work.

48

00:03:45,550 --> 00:03:49,820

In addition to that, there are photovoltaics that sustain

49

00:03:49,840 --> 00:03:53,520

a great deal of the electrical power demand of the building.

50

00:03:53,540 --> 00:03:57,720

If indeed the electrical load, for whatever reason, becomes greater,

51

00:03:57,740 --> 00:04:02,240

we are supplemented by a device called a Bloom Box from Bloom Energy,

52

00:04:02,260 --> 00:04:07,290

which converts natural gas, as a fuel, directly to energy.

53

00:04:07,310 --> 00:04:11,950

There are times when the building will actually either be energy neutral

54

00:04:11,970 --> 00:04:15,720

or will generate more electrical power than it actually requires

55

00:04:15,740 --> 00:04:20,660

and we will contribute power to the power grid.

56

00:04:20,680 --> 00:04:24,950

What we hope to do is have a series of sensors throughout the building

57

00:04:24,970 --> 00:04:30,040

on all energy systems: lighting, heating, cooling, peripheral equipment

58

00:04:30,060 --> 00:04:33,450

such as printers, computers and so forth.

59

00:04:33,470 --> 00:04:38,660

And at any given moment in time, anyone at a workstation will be able to call up

60

00:04:38,680 --> 00:04:40,990

how much energy is being consumed.

61

00:04:41,010 --> 00:04:46,150

And that will give people the information on which to make decisions

62

00:04:46,170 --> 00:04:50,250

that will allow them to be much more energy efficient stewards

63

00:04:50,270 --> 00:04:56,430

of their workspace and their professional environment.

64

00:04:56,450 --> 00:05:00,200

Michael Flynn: Sustainability Base will have a unique water treatment system

65

00:05:00,220 --> 00:05:04,950

that takes hand wash water, shower water, water from all of the sinks in the facility

66

00:05:04,970 --> 00:05:10,940

and will purify that water to potable standards and then utilize it to flush the toilets.

67

00:05:10,960 --> 00:05:14,990

The technology that we're using is derived from a NASA spaceflight

68

00:05:15,010 --> 00:05:17,340

water recycling technology.

69

00:05:17,360 --> 00:05:21,480

For instance all of the water on the International Space Station is recycled water.

70

00:05:21,500 --> 00:05:24,100

And the system that's going into Sustainability Base

71

00:05:24,120 --> 00:05:28,700

is just a larger version of that type of a spaceflight application.

72

00:05:28,720 --> 00:05:33,440

And then for irrigating and watering external we are using tertiary treated water

73

00:05:33,460 --> 00:05:36,800

from local sewage treatment plant, so the overall goal

74

00:05:36,820 --> 00:05:39,910

is to reduce the total water consumption of the building

75

00:05:39,930 --> 00:05:46,750

by upwards of eighty or ninety percent.

76

00:05:46,770 --> 00:05:49,810

Kristina Wilmoth: One of our major goals in this building was not just to end up

77

00:05:49,830 --> 00:05:51,270

with a great design.

78

00:05:51,290 --> 00:05:56,340

It was to end up with a very livable, very pleasant, very useful workspace

79

00:05:56,360 --> 00:06:01,020

for the researchers and employees of Ames Research Center.

80

00:06:01,040 --> 00:06:04,770

And we made our selection for all materials going into the building

81

00:06:04,790 --> 00:06:09,130

to be both healthy and as green as possible for the planet,

82

00:06:09,150 --> 00:06:11,840

not just for the individuals but for the planet.

83

00:06:11,860 --> 00:06:16,510

So, all of our products are GREENGUARD certified or "Cradle to Cradle" certified

84

00:06:16,530 --> 00:06:20,770

and they have very few toxins in them, those that do have low emissions

85

00:06:20,790 --> 00:06:24,300

and the recycled material is in our furniture, it's in our carpets,

86

00:06:24,320 --> 00:06:26,910

it's through all of the products in the building.

87

00:06:26,930 --> 00:06:31,990

We also have the unique opportunity to reuse our products from Ames.

88

00:06:32,010 --> 00:06:35,200

We demolished one of our wind tunnels and we took some of that product

89

00:06:35,220 --> 00:06:36,960

and we put it into our building.

90

00:06:36,980 --> 00:06:41,520

And as a result we have oak flooring in our building that is warm and welcoming

91

00:06:41,540 --> 00:06:47,250

and a really nice reminder of Ames' history.

92

00:06:47,270 --> 00:06:49,410

Scott Poll: One of the things we are most excited about

93

00:06:49,430 --> 00:06:54,640

is that Sustainability Base will be a living test bed for innovative research.

94

00:06:54,660 --> 00:06:58,410

One example is the use of an anomaly detection software tool

95

00:06:58,430 --> 00:07:02,120

called Inductive Monitoring System, or IMS.

96

00:07:02,140 --> 00:07:07,630

In the International Space Station, IMS is used to monitor several key systems.

97

00:07:07,650 --> 00:07:12,030

In Sustainability Base, IMS will use data from building sensors

98

00:07:12,050 --> 00:07:15,160

located throughout the building to automatically learn

99

00:07:15,180 --> 00:07:20,230

how the building typically behaves and then identify anomalies,

100

00:07:20,250 --> 00:07:24,610

or changes in building performance that might otherwise go unnoticed.

101

00:07:24,630 --> 00:07:28,720

Other NASA-developed software solutions such as Hybrid Diagnostic Engine,

102

00:07:28,740 --> 00:07:34,450

or HyDE, will be used to monitor the performance of the geothermal system.

103

00:07:34,470 --> 00:07:38,170

Prognostic models will also be deployed to anticipate faults

104

00:07:38,190 --> 00:07:42,860

and predict when maintenance is needed for the greywater recycling system.

105

00:07:42,880 --> 00:07:47,070

NASA will also collaborate with other government agencies, industry

106

00:07:47,090 --> 00:07:50,820

and academia to try out innovative technologies for sustainability

107

00:07:50,840 --> 00:07:55,370

and try them out in Sustainability Base.

108

00:07:55,390 --> 00:07:57,970

Steve Zornetzer: Sustainability Base is at the leading edge

109

00:07:57,990 --> 00:08:01,690

of what buildings of the future can and will be.

110

00:08:01,710 --> 00:08:04,510

It's an intelligent building. It's a highly efficient building.

111

00:08:04,530 --> 00:08:07,550

It's a building that informs itself,

112

00:08:07,570 --> 00:08:10,360

and its occupants about their carbon footprint,

113

00:08:10,380 --> 00:08:12,270

about their energy consumption

114

00:08:12,290 --> 00:08:18,660

and about how they can perform their jobs in a more efficient and effective manner.

115

00:08:18,680 --> 00:08:22,340

Sustainability Base is a living testbed for the future.

116

00:08:22,360 --> 00:08:26,050

It is an icon for what can be in the built environment.

117

00:08:26,070 --> 00:08:29,720

And it brings NASA ingenuity and NASA creativity

118

00:08:29,740 --> 00:08:32,600

back to the people of Planet Earth.

119

00:08:32,620 --> 00:08:42,150

(Music)